

000005451



INTEROFFICE CORRESPONDENCE

DATE: August 5, 1991

TO: R. W. Hawes, Clean Water Act Division, Bldg. T130B, X2582

FROM: D. S. Murray, Clean Water Act Division, Bldg. T130B, X5940 *DSM*

SUBJECT: OPERATIONS AND SURVEILLANCE REPORT CONCERNING THE SOUTH INTERCEPTOR
DITCH -- DSM-016-91

Per your request to further investigate the South Interceptor Ditch (SID) I am submitting the following operations and surveillance report. Enclosed with the report are 29 photographs depicting the general condition of the ditch, six pages of calculations pertaining to the hydraulic analysis of the SID, and a three page map referencing various information, observations, and locations of structures. Bob James, Eric Mende, and Kitty Woldow of Clean Water Act Division (CWAD) have been of great assistance in compiling this report.

The current condition of the SID capacity is at, or well below, the maximum flow of the 25 year 6 hour storm event. Overflow of the SID will result in a direct hydraulic connection and the potential contamination of Woman Creek by the subsequential erosion and failure of the ditch embankment and/or potential washout of culverts and Rock Grade Control Structures (RGCS). The potential of an existing indirect hydraulic connection with Woman Creek from seepage of the SID is highly probable.

For the purpose of this report I segregated the SID into three segments based on the physical locations of the culvert crossings; the west segment, the central segment, and the east segment. The SID was constructed from 1978 through 1980 for the purpose of intercepting and transporting potentially contaminated surface runoff water from the southern portion of the Rocky Flats Plantsite to Pond C-2. The surface runoff drainage area associated with the SID is 192.6 acres. The SID is approximately 1.45 miles in length (7700 ft.) with the west segment comprising 0.30 miles, the central segment 0.70 miles and the east segment 1.45 miles. The original channel width increases from 5 ft. to 15 ft. from the west segment to east segment respectively. The original channel depth including freeboard was approximately 4 ft. to 8 ft. from the west segment to east segment respectively. The original gradient of the SID was 0.0002%.

There are a total of 18 RGCS. Four of these structures are associated with the west segment, eleven with the central segment, and three with the east segment. The RGCS are designed as energy dissipation structures to control flow velocities, thereby reducing scouring and erosion. There is a total of four culvert crossings associated with the SID; one in the west segment, one in the central segment, and two in the east segment. The culvert crossings provide vehicular access to the Woman Creek area and also aid in the reduction of flow velocities. Culvert #4 conveys SID water under Woman Creek to Pond C-2.

ADMIN RECORD

Document Classification
Review Waiver per RFP
Classification Office

The SID was originally designed to accommodate the flow from a 100-year 3-day storm event, with freeboard (see table 2, SID Hydraulic Analysis as Built). Currently the SID, with freeboard at stations 29+00 and 31+40 is only capable of carrying 6.27% and 4.92% of the original design flow respectively (see table 4). Similar reductions in the percentage of design flow are seen in the 25 year 6 hour event, 25 year 3 day event, 100 year 6 hour event and the 100 year 3 day event at these stations (see tables 6, 8, 10, & 12). At this time the SID central segment is not capable of adequately carrying the 25 year 6 hour storm event.

The two predominant factors contributing to the reduction in the percentage of design flow capacity of the SID are the vegetation in the ditch and the reduction of ditch widths and depths because of deposition (see photographs 3, 6, 12, 13, 15, 20, 22, 25). A secondary problem associated with vegetation is the accumulation of dead plant debris and refuse. This is a significant contribution to the obstruction of flow (see photographs 8, 9, 10, 12, 14, 16). At culvert crossing number one, for example, the overgrown vegetation and accumulation of debris is so excessive that the discharge portion of the culvert cannot be located (see photographs 5, 6).

The South Interceptor Ditch Hydraulic Analysis (tables 1 through 12) illustrates the hydraulic properties of the SID as built, the current conditions of the ditch from field surveillance inspections, and extrapolations of the ditch's flow capacity in relationship to various storm events. Tables 1 and 2 depict the SID hydraulic properties as built without freeboard and with freeboard respectively. Without freeboard exhibits the absolute flow capacity of the SID. This would represent the undesirable situation at which the water elevation would be at the crest of the ditch embankment. With freeboard represents the desired water elevation in the SID during the 100 year 3 day storm event.

Tables 3 and 4 represent the current conditions of the SID and depict the reduction in carrying capacity expressed as percent of design flow. This is predominantly attributable to changes in the calculated Mannings Number and the width and depth of the channel. The Mannings Number is a subjective portrayal of the channel condition in association with the basic roughness, degree of irregularity, change in shape of cross section, obstruction by debris and roots, and values for the amount of vegetation in the channel. Under existing conditions, eight of the ten randomly selected surveillance stations are not capable of carrying the original design flow.

Tables 5 through 12 compare the existing maximum flow capabilities of the SID with Estimated Peak Flows from various storm events. Tables 5, 7, 9, and 11 indicate the potential of water overtopping the embankment crest in all storm events. The stations of concern are 21+00, 29+00, and 31+00. These stations are mostly within the central segment of the SID. Tables 6, 8, 10, and 12 exhibit similar reductions in maximum flow capacities of the SID during the various storm events.

In the west segment of the SID, stations 3+25, 5+50, 14+00 are capable of carrying the 25 year 6 hour and 3 day storm events by utilizing the freeboard. With or without freeboard, station

5+50 may not have the capability to carry maximum flows from any of the other storm events. Culvert #1 is not accessible for inspection at this time because of the overgrowth and probable sedimentation at the outlet. All of the RGCS in this segment are in need of vegetation and debris removal (photographs 1-5).

The central segment of the SID (stations 29+00, 31+40, 40+50, and 49+00) represents the most critical segment of the ditch at this time. Stations 29+00 through 31+40 are most prone to failure from any storm event with or without freeboard. This is because of overgrown vegetation, sedimentation and the accumulation of debris. Culvert #2 is in immediate need of vegetation control at the inlet. All of the RGCS in the central segment are in need of vegetation and debris removal (photographs 5-21).

The east segment of the SID (stations 63+00 and 76+00) is overgrown. Station 76+00 is a critical segment of the ditch because of its proximity to Woman Creek and Pond C-2. Culvert #4 is in immediate need of vegetation control at the inlet. All of the RGCS in this area are in need of vegetation and debris elimination (photographs 20-29).

Another potential problem that became apparent from surveillance observations of the SID is seepage. On three occasions I observed water entering the ditch in the area of the 460 outfall (central segment) at approximately 3 to 5 gpm, with water not being apparent near station 63+00 (east segment). Along the entire SID there may be as many as 7 possible seepage areas. Six of these seepage areas would be contributing water to Woman Creek, whereas the seepage associated with station 76+00 would be Woman Creek contributing water to Pond C-2 (photographs 3, 25, 26, 27 and 29). Further investigation into possible seepage of the SID and the potential impacts to the Woman Creek drainage should be conducted.

Immediate measures must be taken to alleviate this situation. The central segment of the SID from Culvert #1 through station 40+50 must be cleared. The use of burning or another preferred method of vegetation control is imperative. Culverts #1, #2, and #4 must be cleaned and have unobstructed inlets and outlets; burning and the use of chainsaws will be required. All of the Rock Grade Control Structures will require upstream vegetation control and the removal of the accumulated debris and litter from on and around the structures.

An annual maintenance program must be established for the SID as well as many other water conveyance structures in the buffer zone. The CWAD Surface Water Upgrades group could proceed with the engineering and coordination of this and other projects as the CWAD Operations and Surveillance group continues to identify potential problems with the water courses. The EM/NEPA division will need to provide guidance as to the relationship of the maintenance of water control structures versus the designation of wetlands or potential wildlife habitats. The issue of the SID's original purpose must be reiterated: the SID is a water conveyance structure designed to transport

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potentially contaminated surface runoff water from the southern portion of the Rocky Flats Plantsite to terminal Pond C-2. By stifling routine maintenance programs we are significantly increasing the probability of structure failure which will inevitably result in an uncontrolled release of potential contamination and the damage of property.

DSM:fm

Enclosure:
As Stated

cc:

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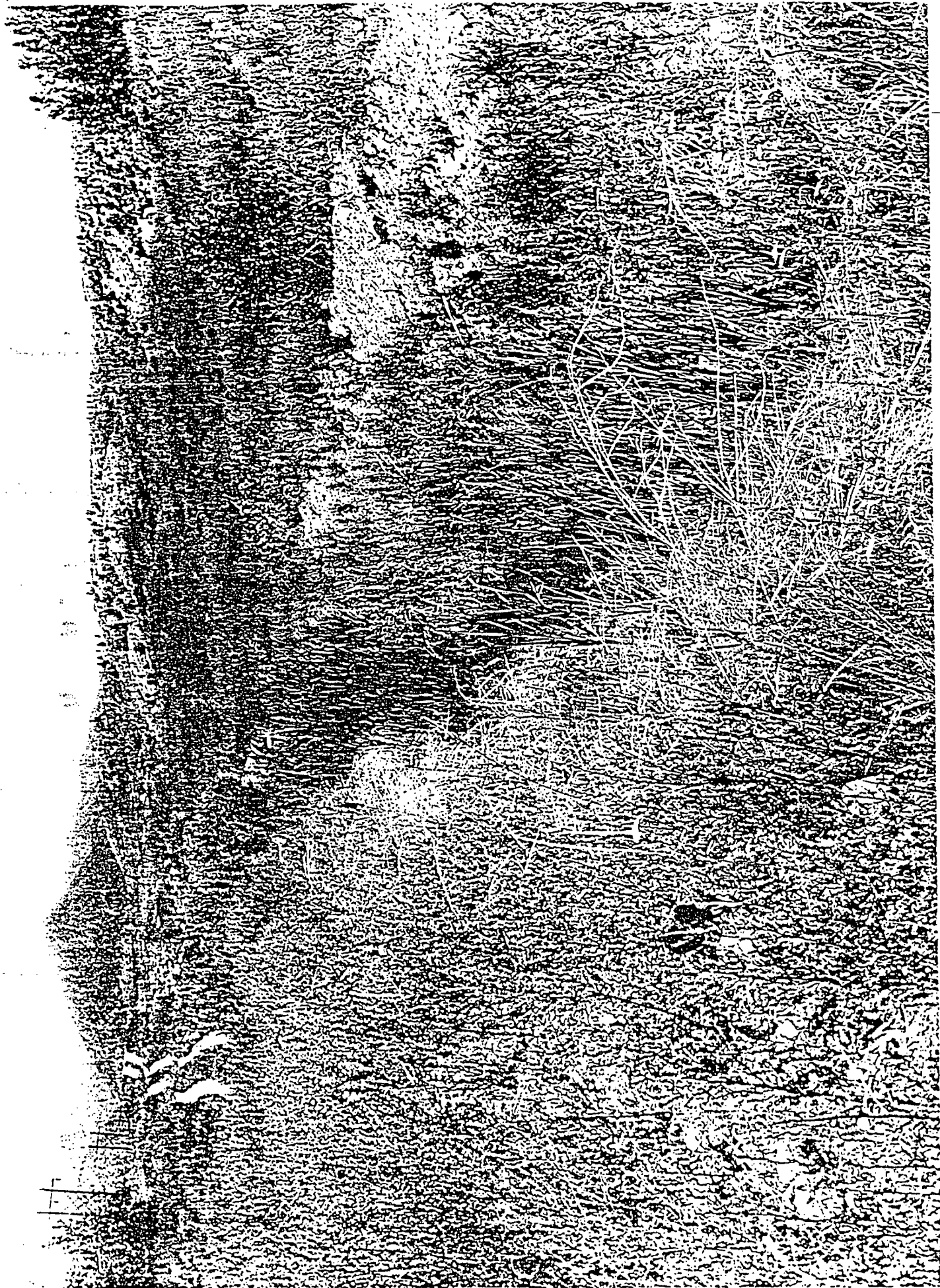


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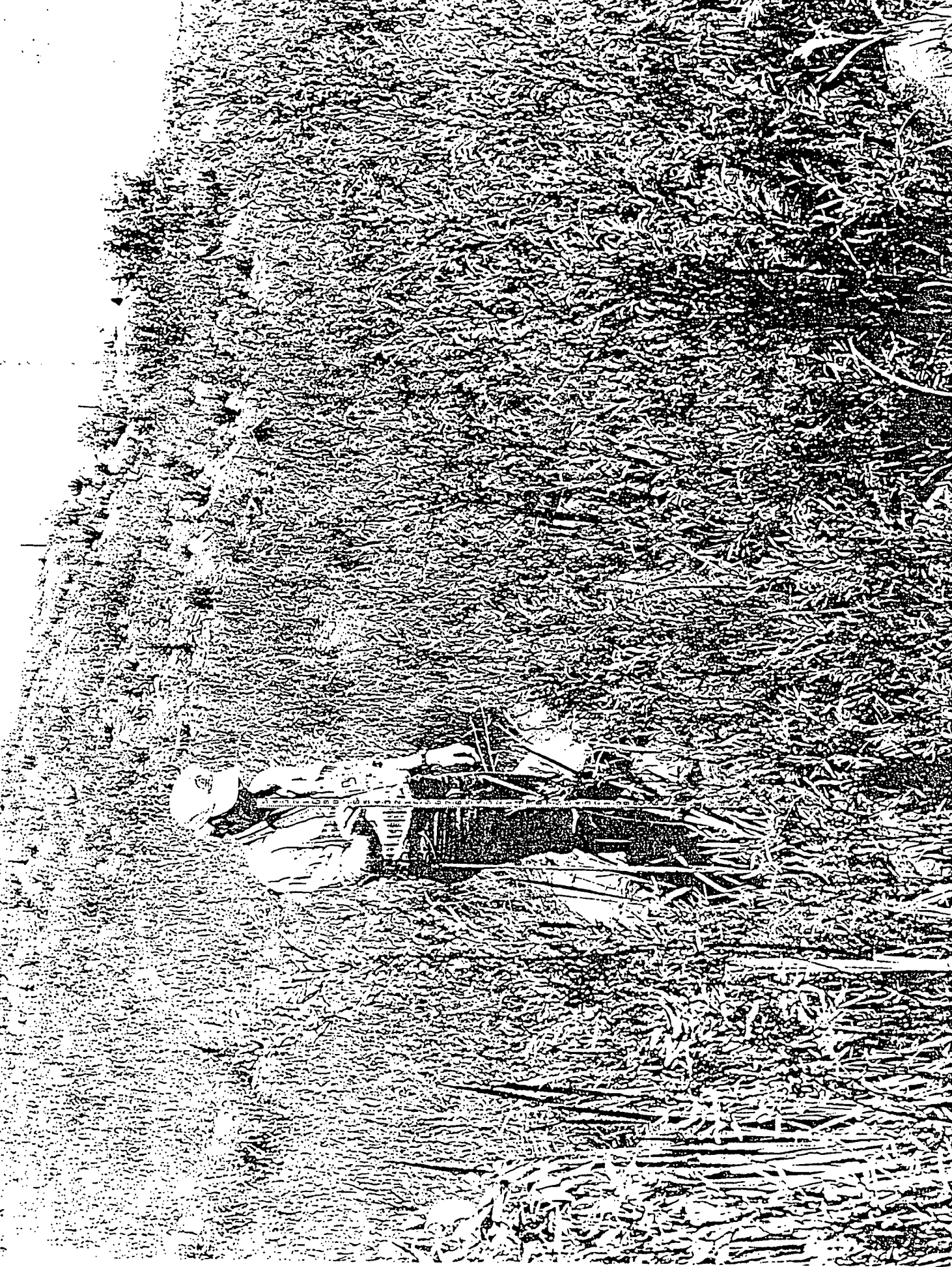
2. South Interceptor Ditch, West segment, West Aspect, Near old landfill area; Hole metal refuse and vegetative growth.



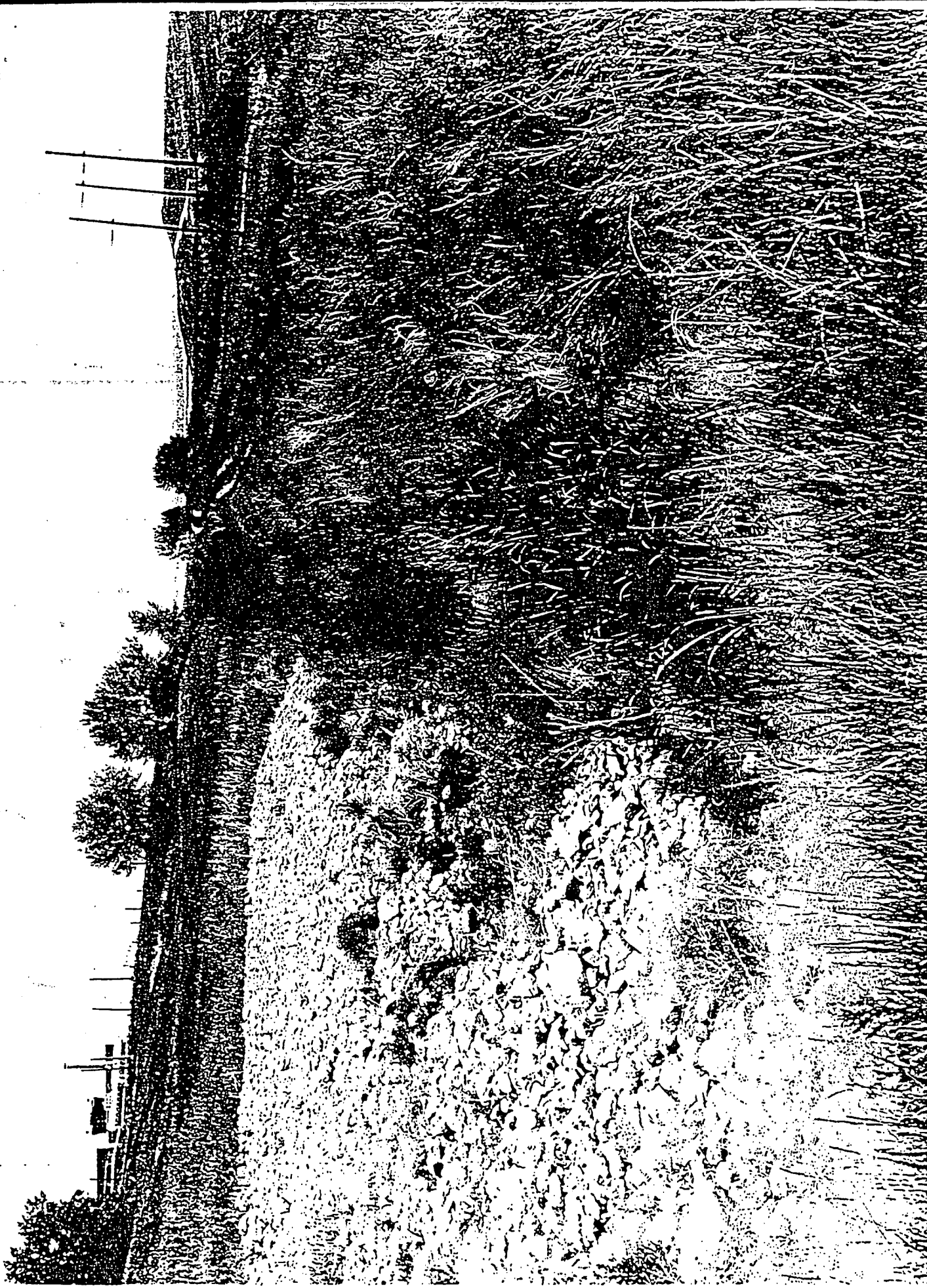
3. South Interceptor Ditch, West segment, East aspect. Note pooling in front of cattails.



4. South Interceptor Ditch, West segment, East aspect. Note vegetative growth, approximately 6 ft. tall. This has intruded on energy dissipation structure.



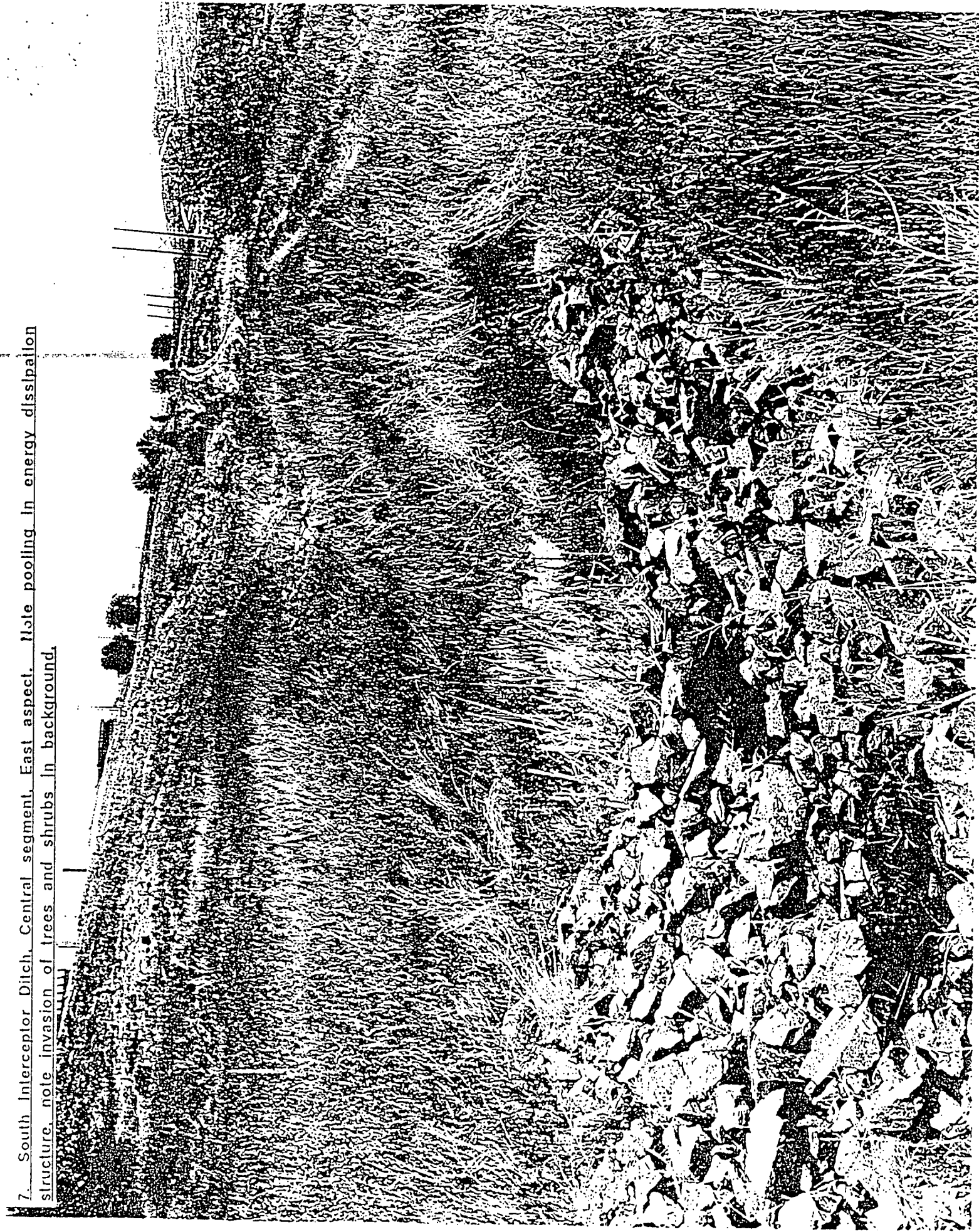
5. South Interceptor Ditch, Central segment, East aspect. Note tumble weeds in foreground and overall vegetative growth.



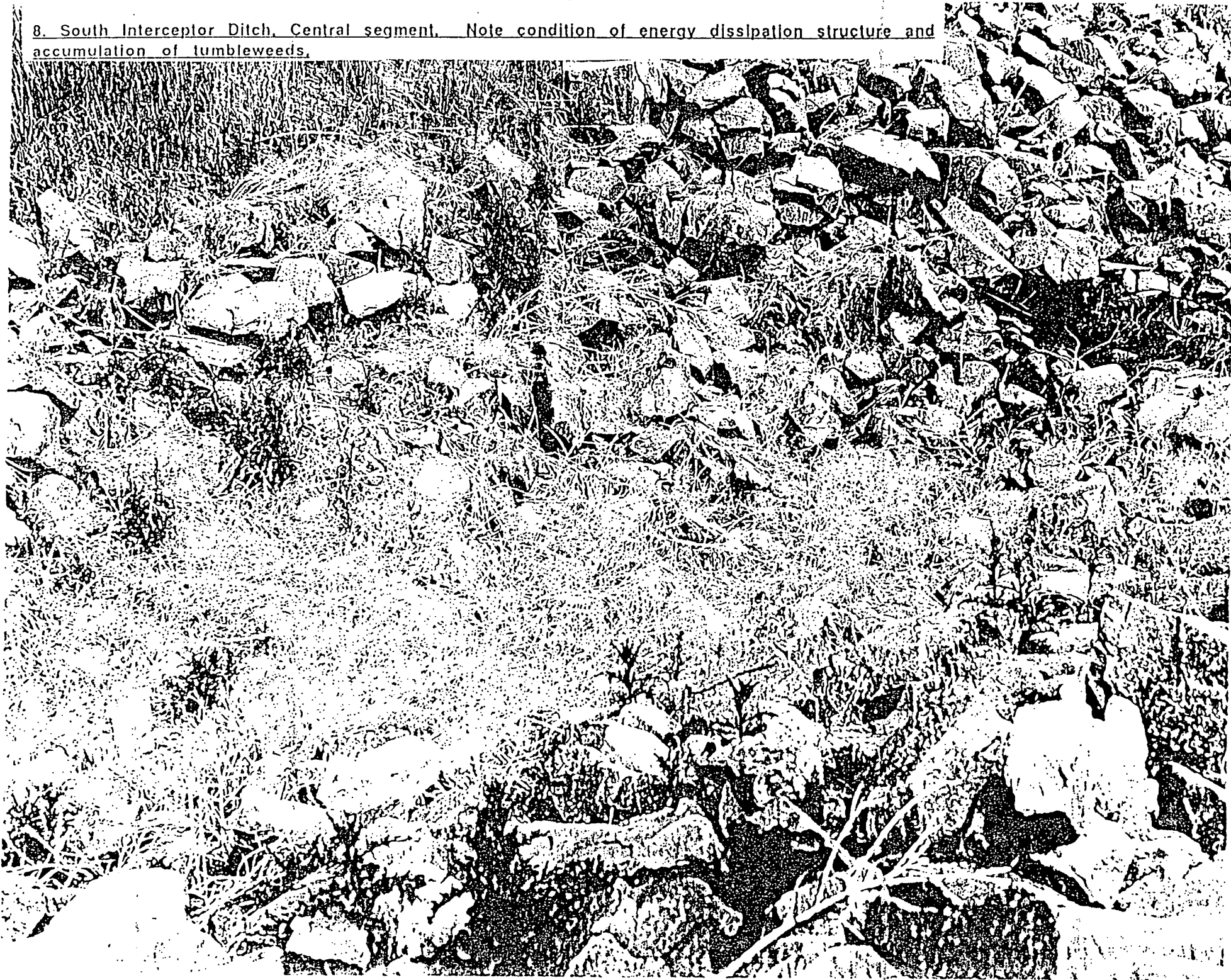
6. South Interceptor Ditch. Central segment. Relating to #5. vegetative growth in excess of 6 ft.



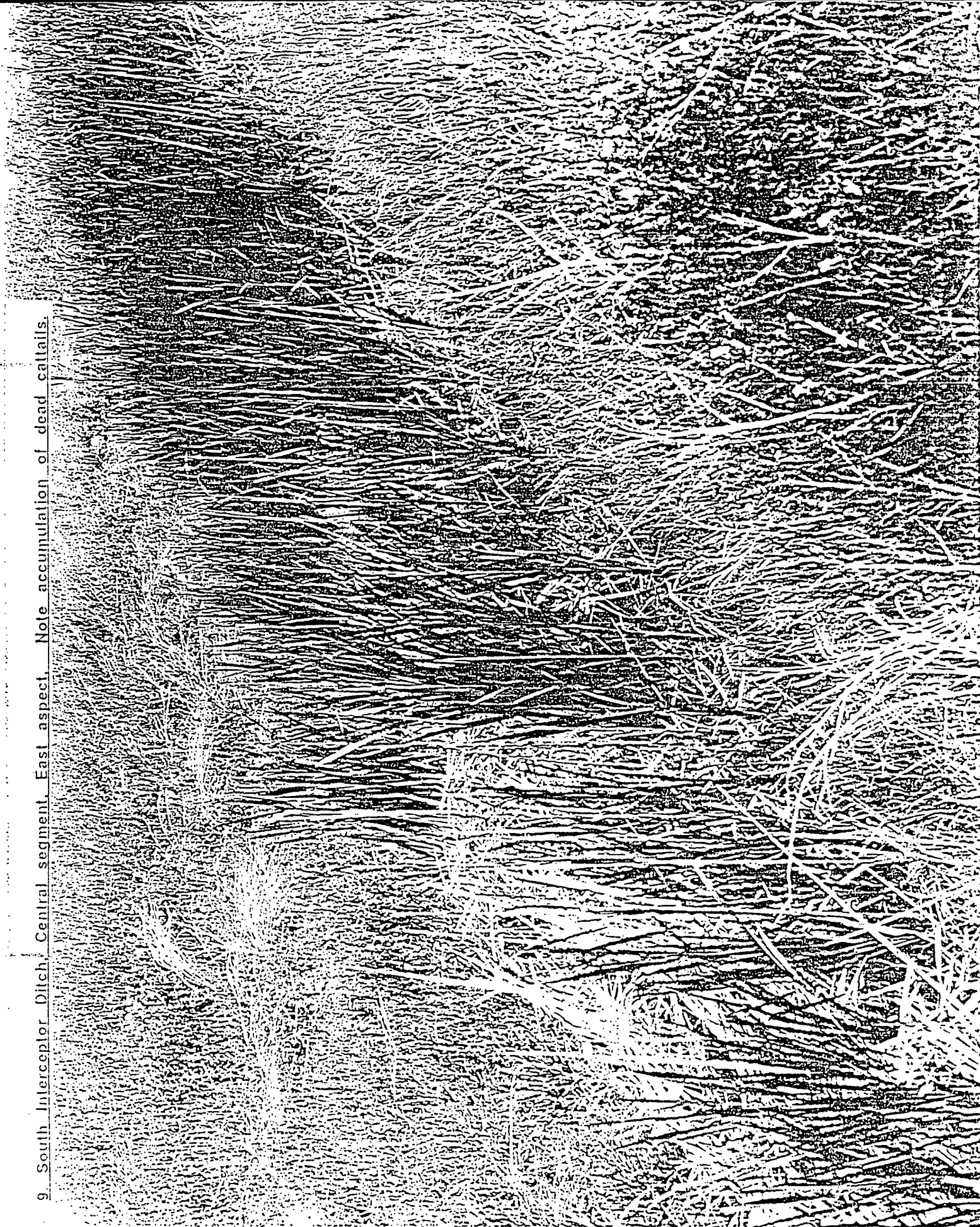
7. South Interceptor Ditch, Central segment, East aspect. Note pooling in energy dissipation structure, note invasion of trees and shrubs in background.



8. South Interceptor Ditch, Central segment. Note condition of energy dissipation structure and accumulation of tumbleweeds.



9. South Interceptor Ditch, Central segment, East aspect. Note accumulation of dead cattails.



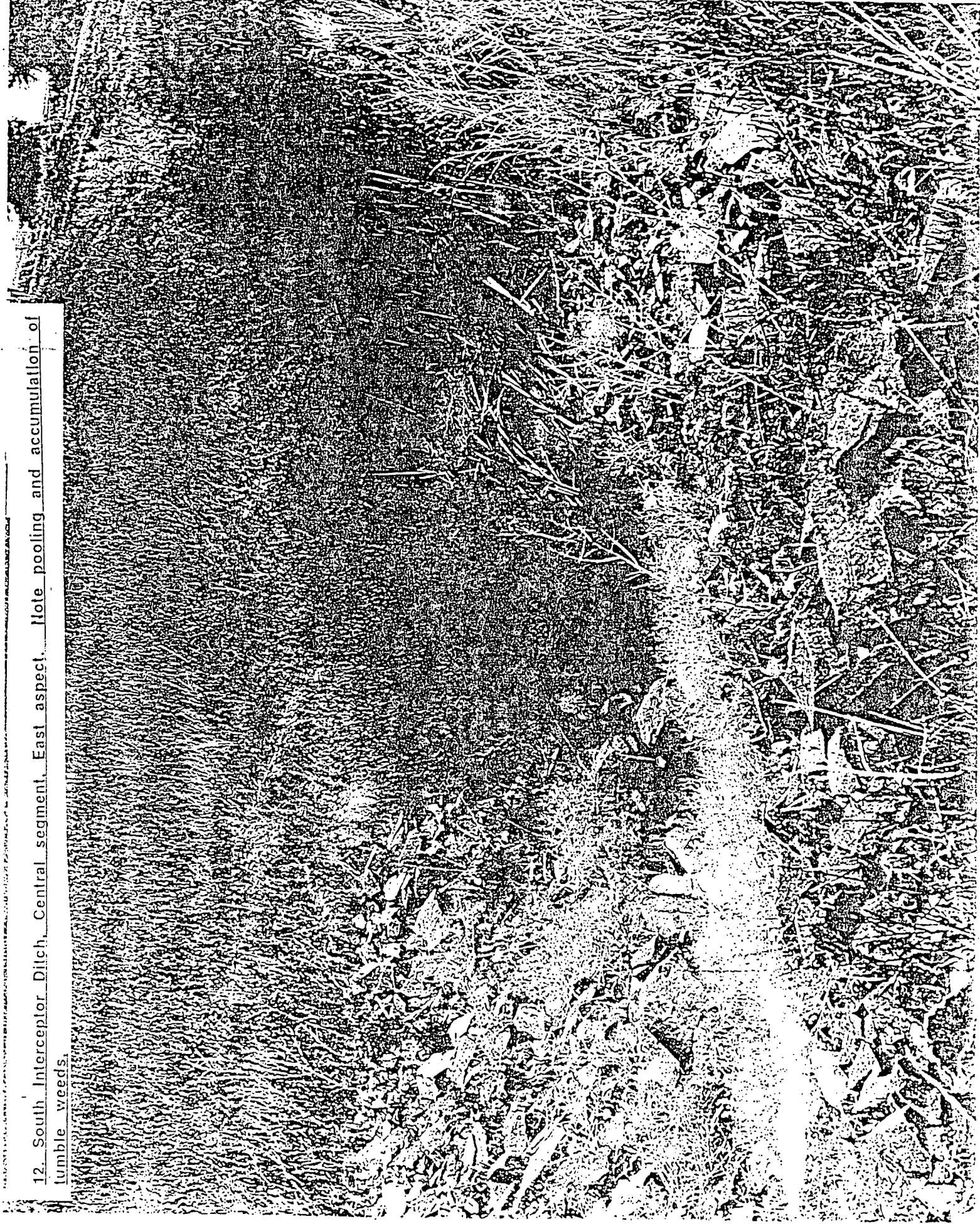
10. South Interceptor Ditch, Central segment, East aspect. Note accumulation of dead cattails and 55 gallon drum.



11. South Interceptor Ditch, Central segment. Note trees in upstream portion of energy dispersion area. Note condition of rip-rap.



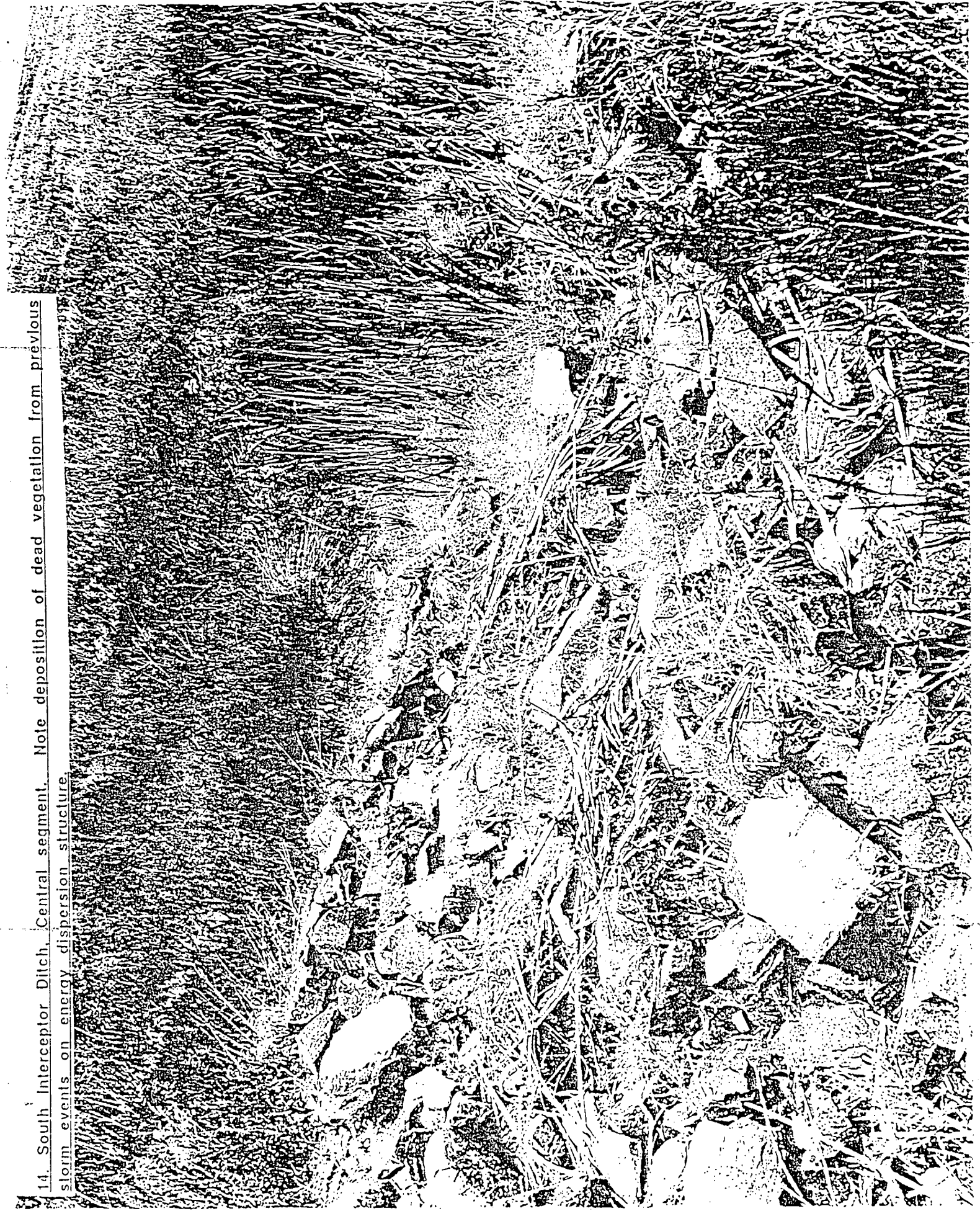
12. South Interceptor Ditch, Central segment, East aspect. Note pooling and accumulation of tumble weeds.



13. South Interceptor Ditch, Central segment, West aspect. Note condition of rip-rap in background. Note height of bottom of ditch to crest of dike. Approximately 2 ft. to overlapping of dike occurs.



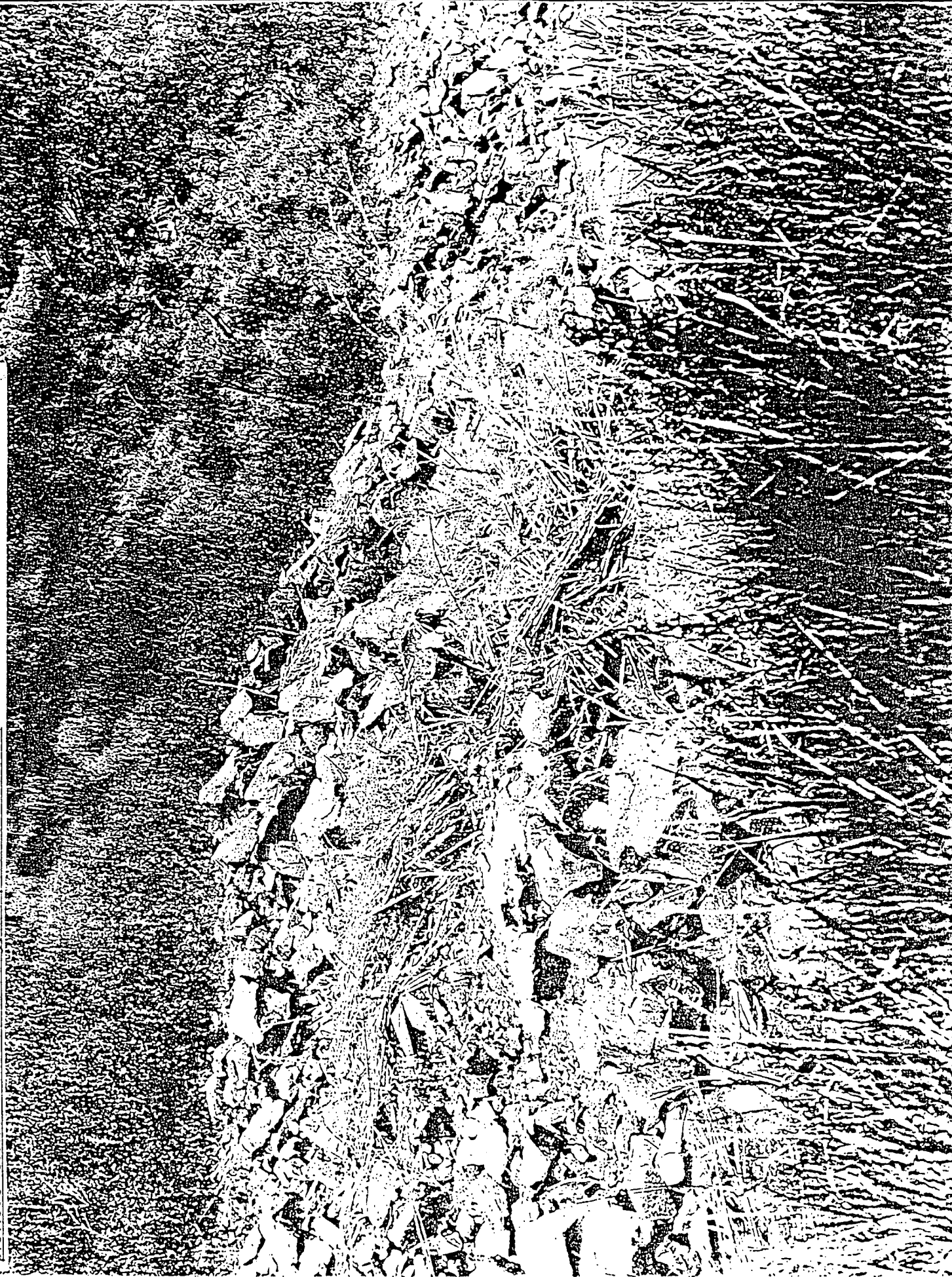
14. South Interceptor Ditch, Central segment. Note deposition of dead vegetation from previous storm events on energy dispersion structure.



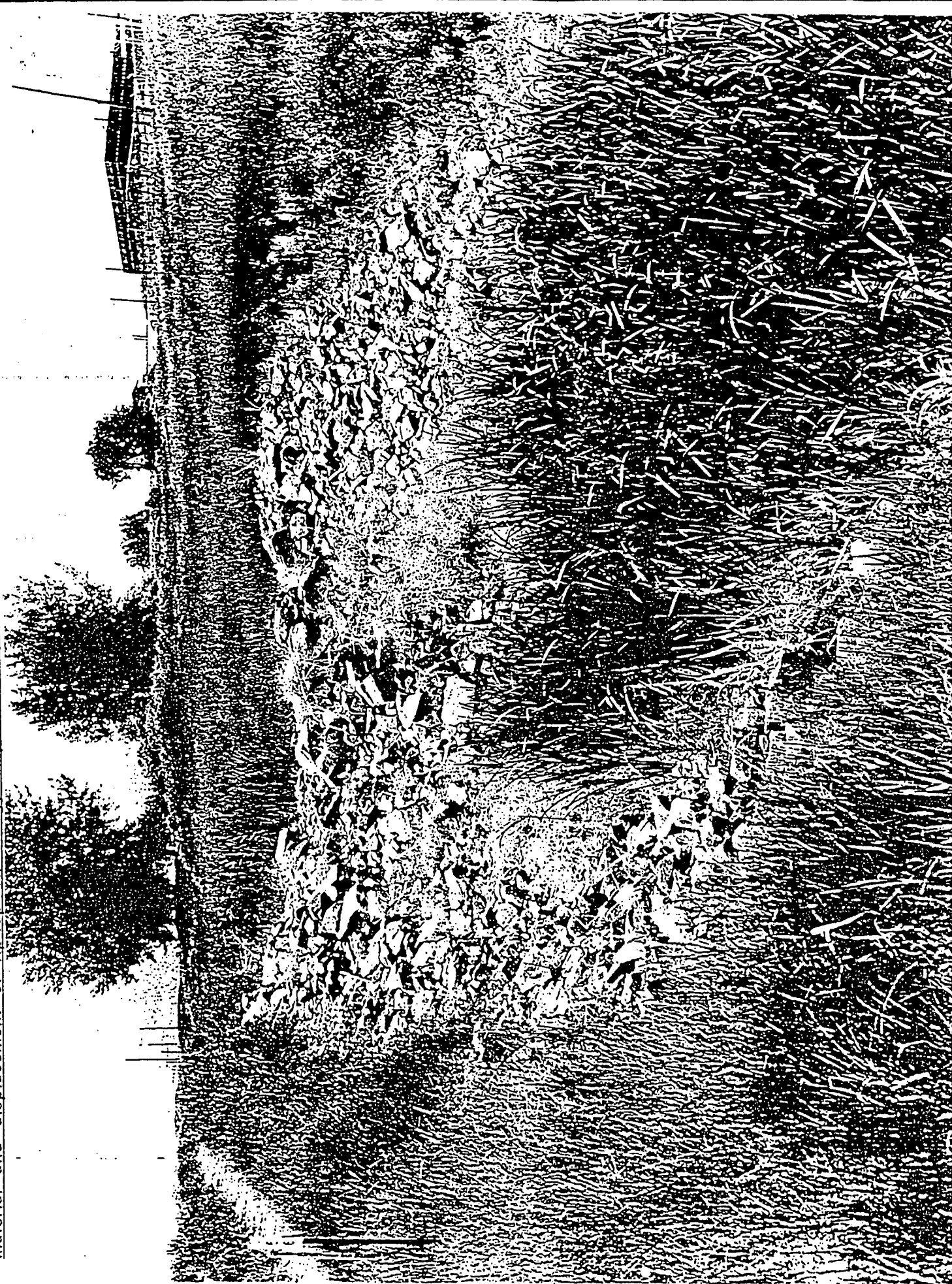
15. South Interceptor Ditch, Central segment. Note reduction in width of ditch due to sloughing.



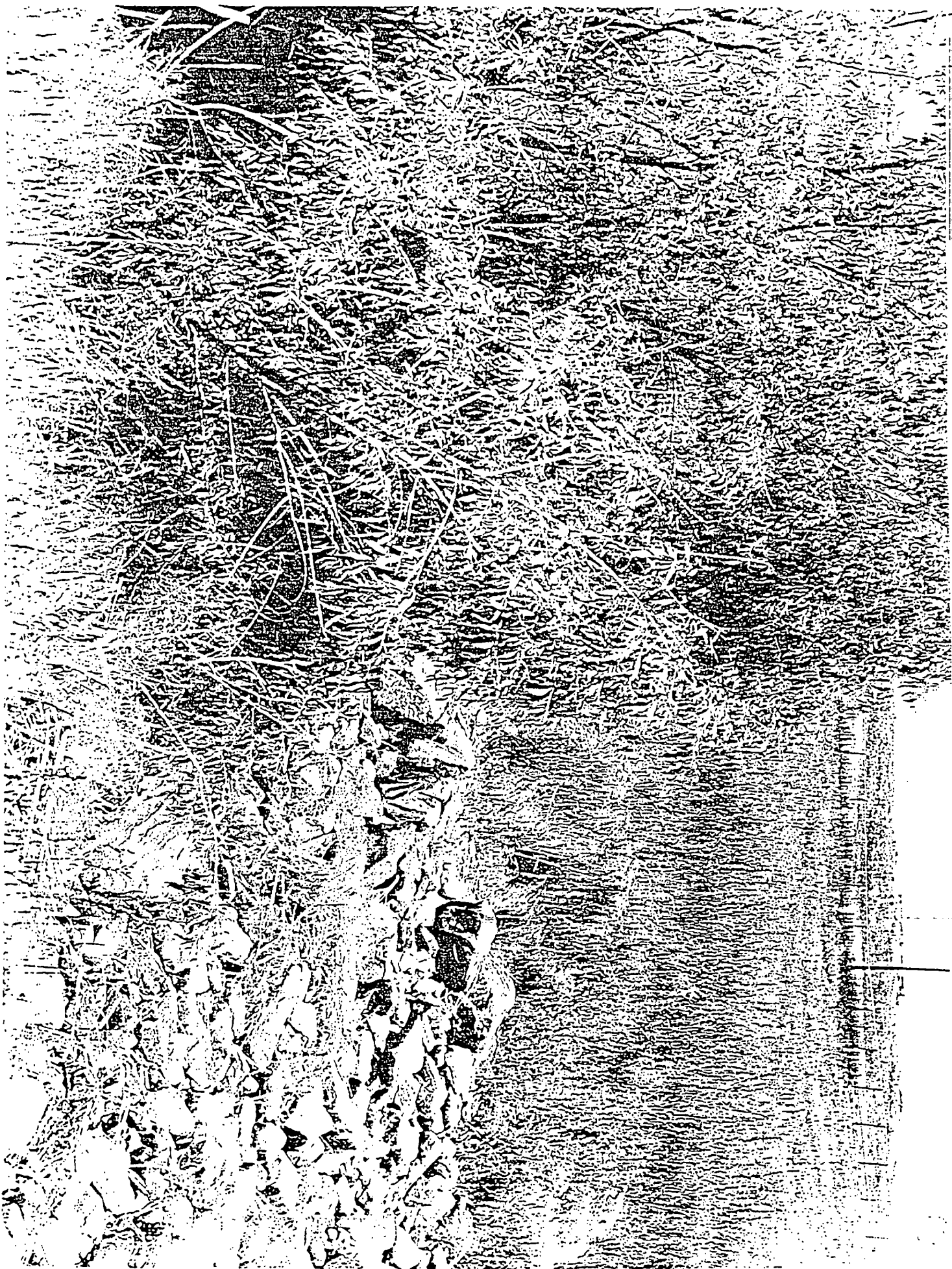
16. South Interceptor Ditch, Central segment. Note deposiiton of vegetative material from previous storm events on energy disperslon structure.



17. South Interceptor Ditch, Central segment, West aspect. Note deposiiton of vegetative material and displacement of rip-rap on energy dispersion structure.



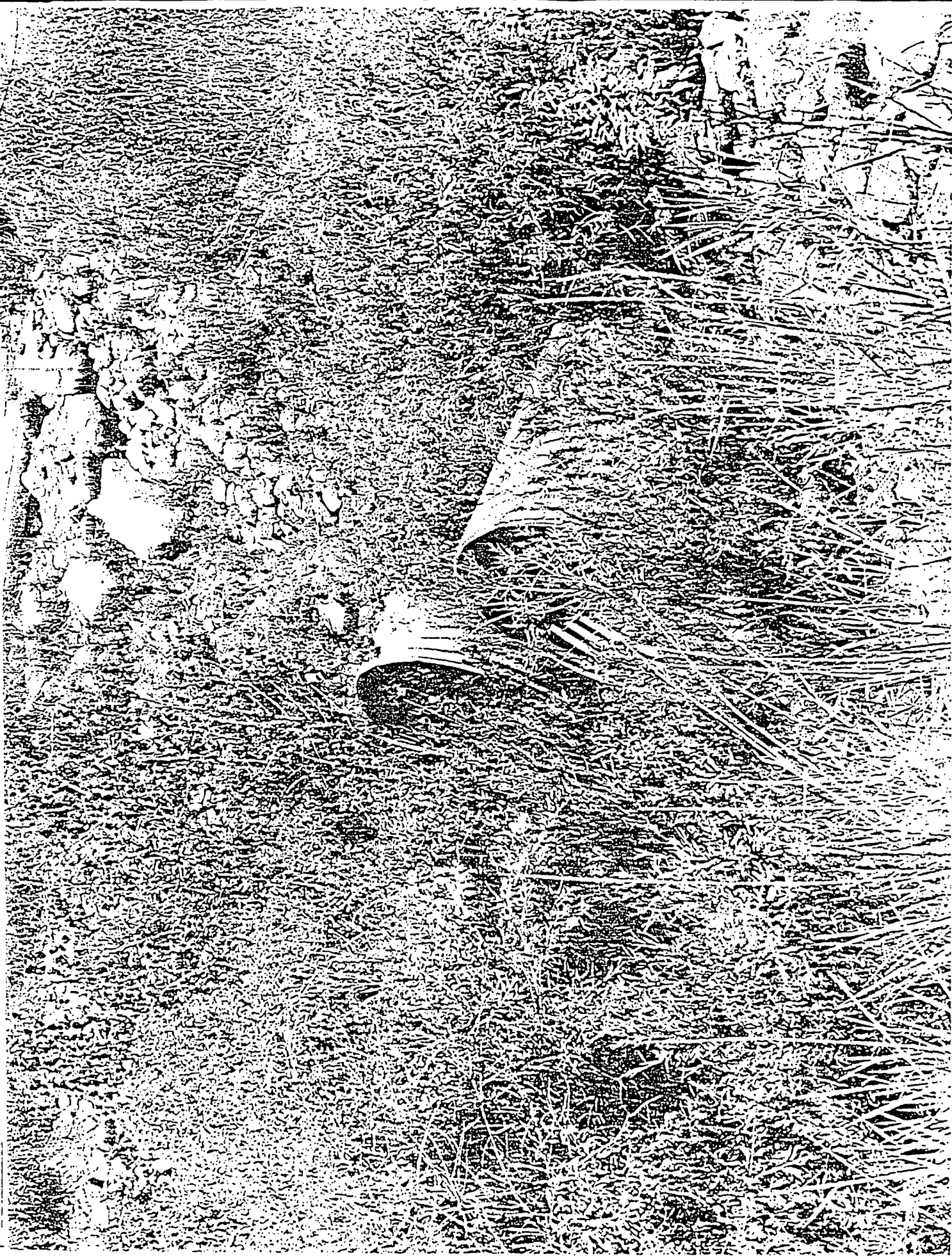
18 South Interceptor Ditch, Central segment. Note establishment of trees in upstream of energy dispersion structure.



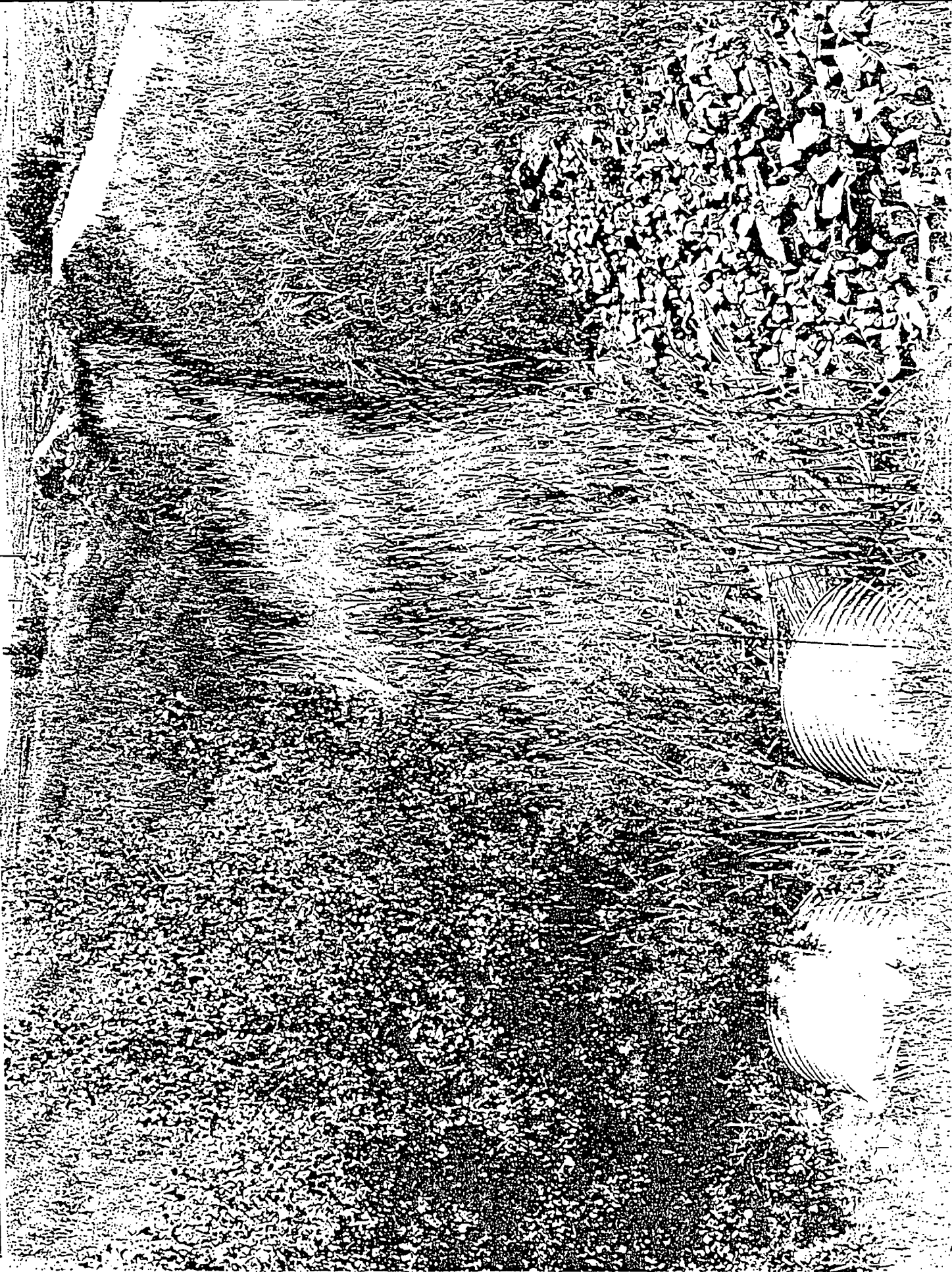
19. South Interceptor Ditch, Central segment, East aspect, General view depicting vegetation in ditch.



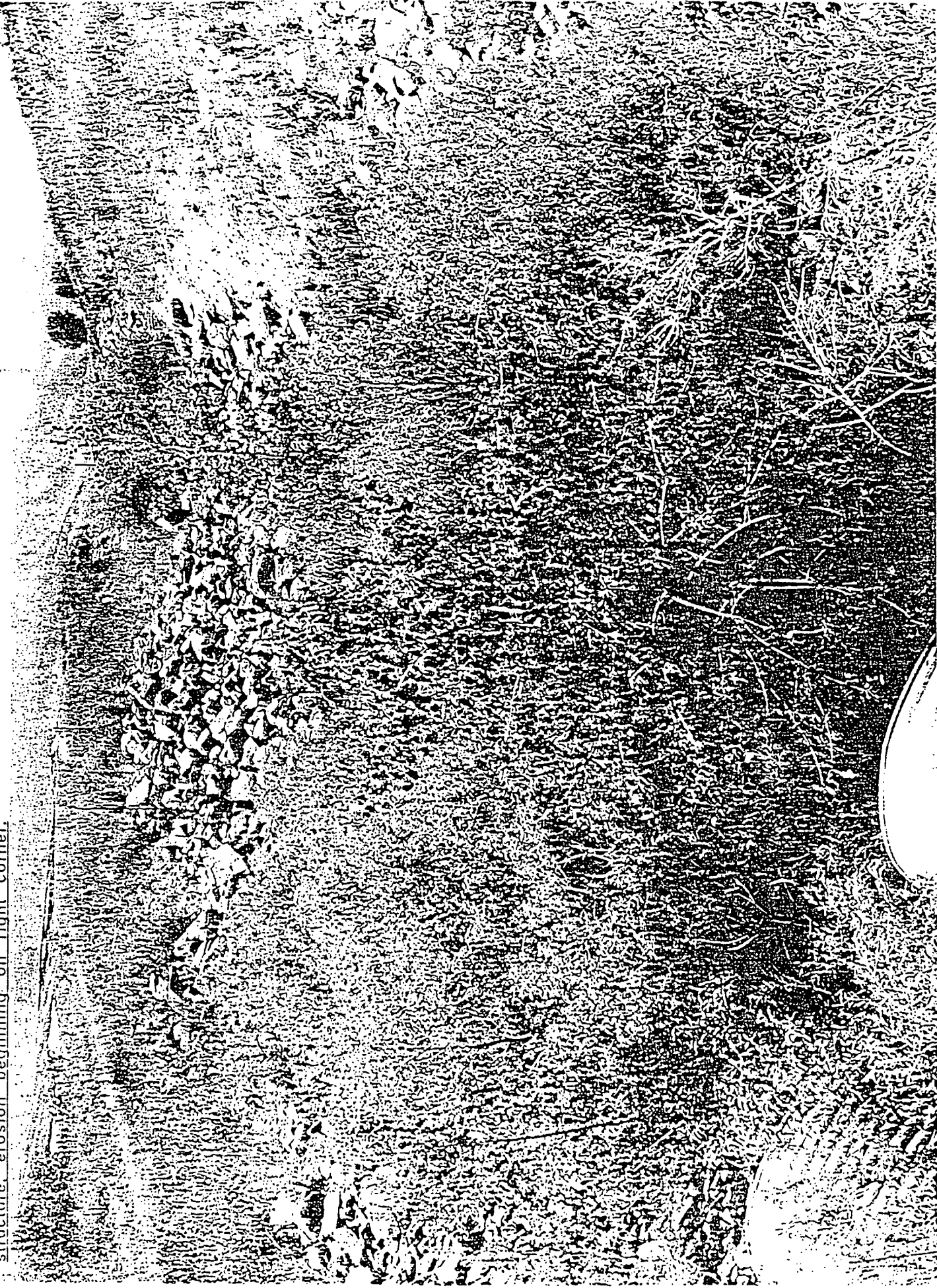
20. South Interceptor Ditch, East segment. Note vegetative growth on upstream portion of culverts.



21. South Interceptor Ditch, East segment, East aspect. Note vegetative growth on downstream portion of culverts.



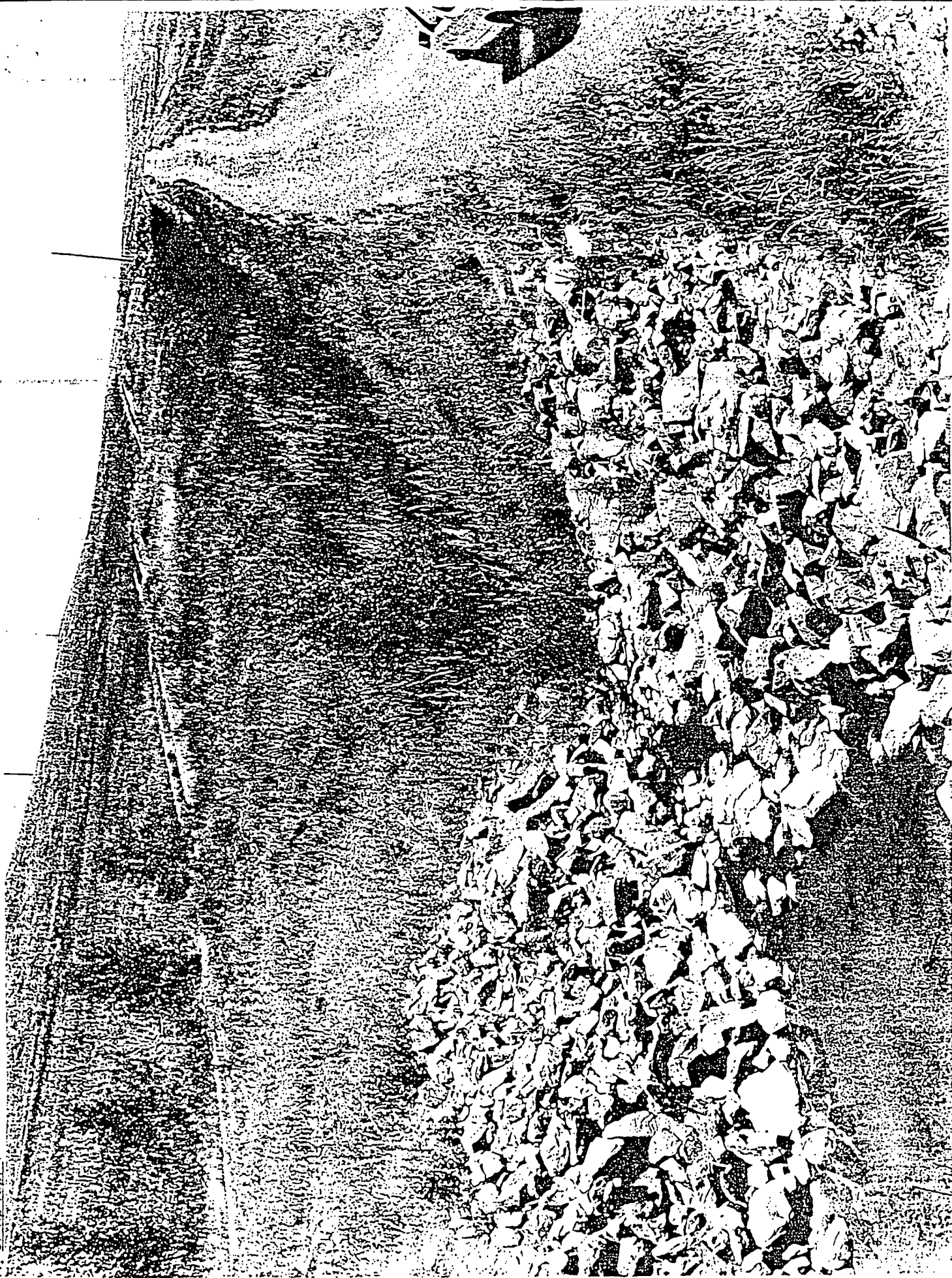
22. South Interceptor Ditch, East segment, West aspect. Note vegetative (trees) growth on upstream portion of culverts. Note condition of (movement) of rip-rap on energy dispersion structure, erosion beginning on right corner.



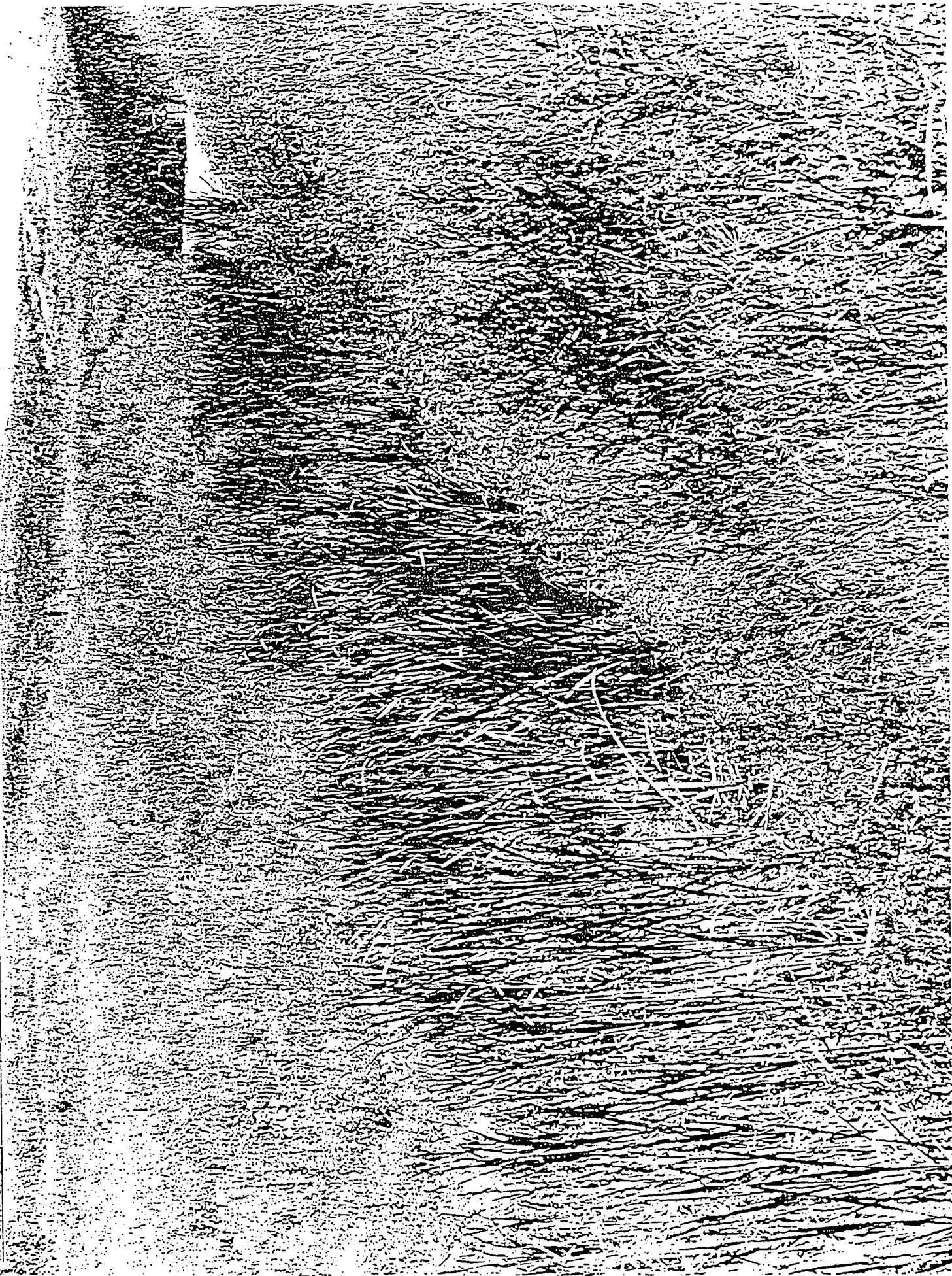
23. South Interceptor Ditch, East segment. Note erosion and rodent burrowing on north portion of energy dispersion structure.



24. South Interceptor Ditch, East segment, East aspect. Note overall vegetation growth and condition of rip-rap.



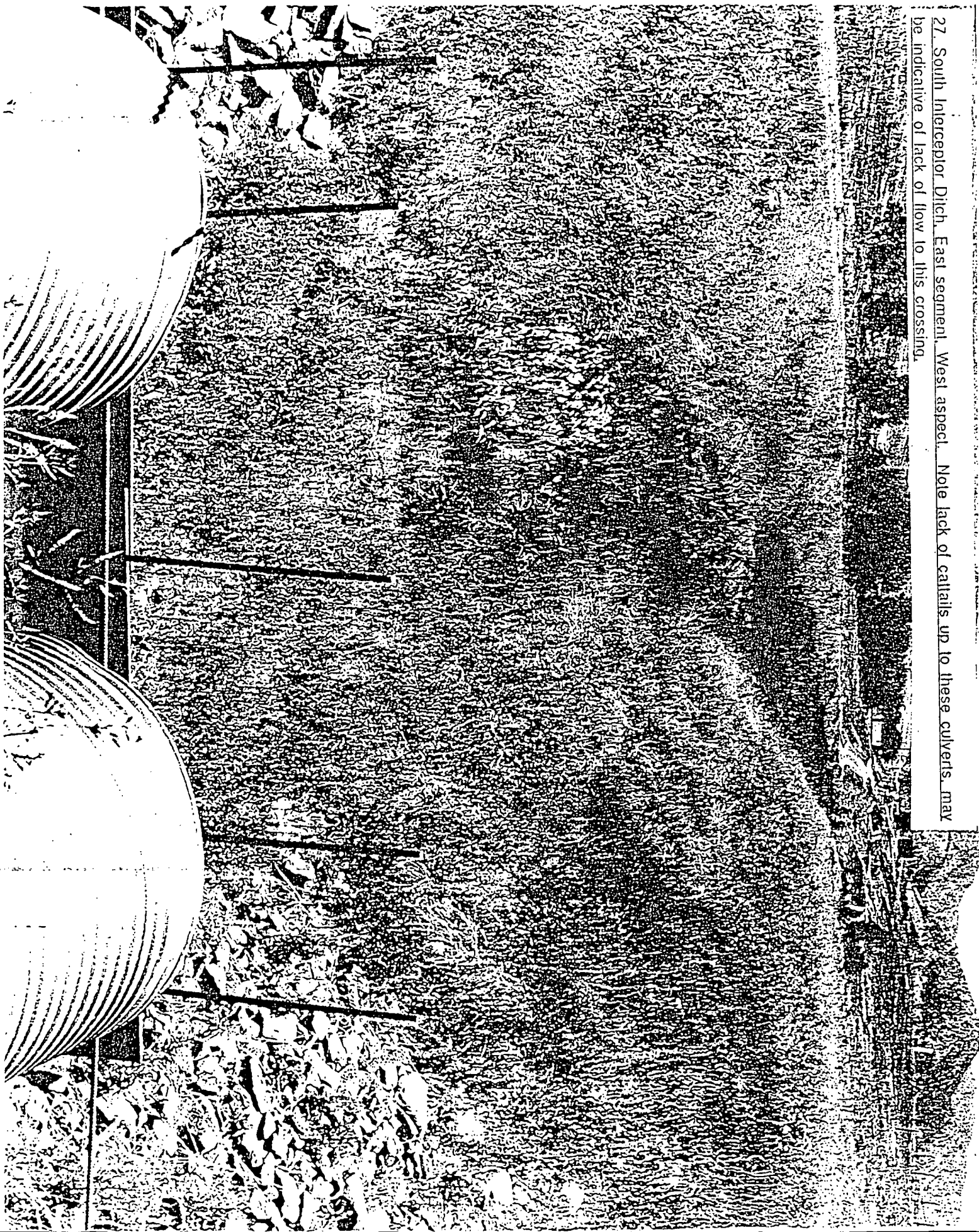
25. South Interceptor Ditch, East segment, East aspect. Note upper right portion of ditch that is devoid of cattails, suspected seepage area. Also notice amount of dead vegetation.



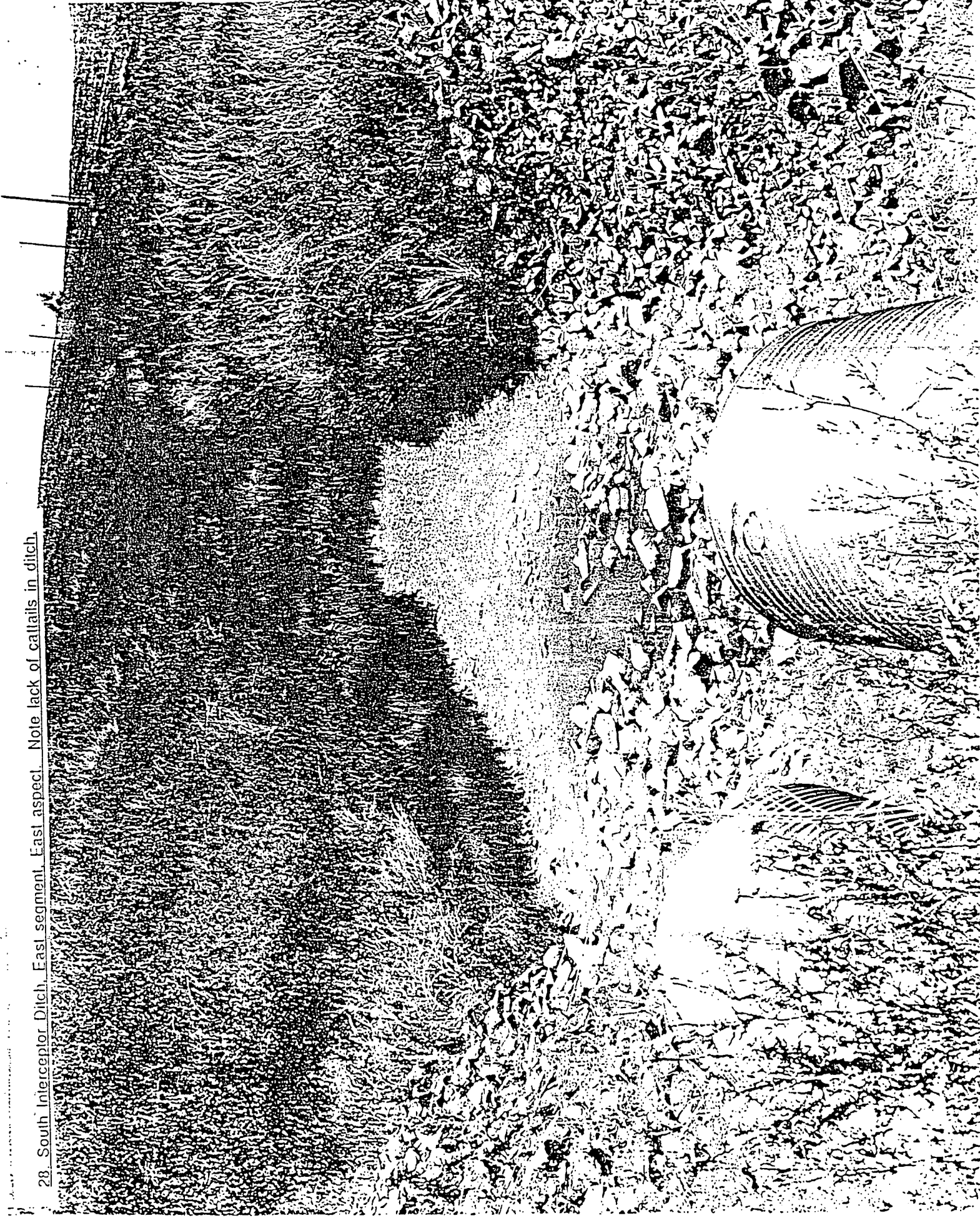
25. Down gradient of South Interceptor Ditch, East segment, West aspect, Overlooking Women Creek. Photo coincides with #25 depicting possible seepage area entering Women Creek. Note callails in foreground on ditch embankment vs. callails associated with Women Creek.



27. South Interceptor Ditch, East segment, West aspect. Note lack of cattails up to these culverts, may be indicative of lack of flow to this crossing.



28. South Interceptor Ditch, East segment, East aspect. Note lack of cattails in ditch.



29. South Interceptor Ditch at Pond C-2. Note standing water near SID outlet to pond C-2, water may be indicative of seepage from Women Creek to Pond C-2 because water was not flowing through the ditch at the time of this photo.



SOUTH INTERCEPTOR DITCH HYDRAULIC ANALYSIS

TABLE #1

SOUTH INTERCEPTOR DITCH HYDRAULIC PROPERTIES AS BUILT. W/O FREEBOARD

		MAX DESIGN			CALCULATED			
	CHANNEL	DEPTH (D)		HYDRAULIC	MANNINGS	MAXIMUM	DESIGN	%OF
STATION	WIDTH (B)	W/O FREEBD	AREA (SF)	RADIUS	N	FLOW (CFS)	FLOW (CFS)	DESIGN FLOW
3+25	5.00	4.30	58.48	2.41	0.025	88.48	36.00	245.77%
5+50	5.00	4.30	58.48	2.41	0.025	88.48	36.00	245.77%
14+00	5.00	4.30	58.48	2.41	0.025	88.48	36.00	245.77%
21+00	8.00	5.80	113.68	3.35	0.025	214.01	90.00	237.79%
29+00	8.00	5.80	113.68	3.35	0.025	214.01	90.00	237.79%
31+40	8.00	5.80	113.68	3.35	0.025	214.01	90.00	237.79%
40+50	10.00	6.60	153.12	3.87	0.023	345.30	150.00	230.20%
49+00	14.00	6.60	179.52	4.13	0.023	422.11	297.00	142.13%
63+00	14.00	8.10	244.62	4.87	0.023	642.55	297.00	216.35%
76+00	15.00	6.00	162.00	3.87	0.023	365.18	327.00	111.68%

TABLE #2

SOUTH INTERCEPTOR DITCH HYDRAULIC PROPERTIES AS BUILT. WITH FREEBOARD

		FLOW DESIGN			CALCULATED			
	CHANNEL	DEPTH		HYDRAULIC	MANNINGS	MAXIMUM	DESIGN	%OF
STATION	WIDTH (B)	W/FREEBD	AREA (SF)	RADIUS	N	FLOW (CFS)	FLOW (CFS)	DESIGN FLOW
3+25	5.00	2.82	30.00	1.70	0.025	35.99	36.00	99.96%
5+50	5.00	2.82	30.00	1.70	0.025	35.99	36.00	99.96%
14+00	5.00	2.82	30.00	1.70	0.025	35.99	36.00	99.96%
21+00	8.00	3.83	59.98	2.39	0.025	90.07	90.00	100.08%
29+00	8.00	3.83	59.98	2.39	0.025	90.07	90.00	100.08%
31+40	8.00	3.83	59.98	2.39	0.025	90.07	90.00	100.08%
40+50	10.00	4.36	81.62	2.77	0.023	147.03	150.00	98.02%
49+00	14.00	5.47	136.42	3.55	0.023	290.02	297.00	97.65%
63+00	14.00	5.47	136.42	3.55	0.023	290.02	297.00	97.65%
76+00	15.00	5.61	147.09	3.67	0.023	319.87	327.00	97.82%

NOTE: REQUIRED FREEBOARD RANGES FROM 1.5 FT TO 2.7 FT DEPENDING ON DESIGN FLOW

AS DETERMINED FROM FIG. 1-9 "DESIGN OF SMALL CANAL STRUCTURES"

36 CFS=1.5 FT FREEBOARD, 90 CFS=2.1 FT FREEBOARD, 150 CFS=2.2 FT FREEBOARD, 297 CFS=2.6 FT FREEBOARD, 327 CFS=2.7 FT FREEBOARD

SOUTH INTERCEPTOR DITCH HYDRAULIC ANALYSIS

TABLE #3	
1	2
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99	100

SOUTH INTERCEPTOR DITCH HYDRAULIC PROPERTIES FROM FIELD SURVEILLANCE. W/O FREEBOARD

		MAX			CALCULATED			
	CHANNEL	DEPTH (D)		HYDRAULIC	MANNINGS	MAXIMUM	DESIGN	%OF
STATION	WIDTH (B)	W/O FREEBD	AREA (SF)	RADIUS	N	FLOW (CFS)	FLOW (CFS)	DESIGN FLOW
3+25	5.00	7.90	164.32	4.07	0.060	146.89	36.00	408.02%
5+50	5.00	4.80	70.08	2.65	0.085	33.17	36.00	92.15%
14+00	5.50	6.70	126.63	3.57	0.045	138.21	36.00	383.92%
21+00	8.00	5.70	110.58	3.30	0.115	44.82	90.00	49.80%
29+00	6.00	3.80	51.68	2.25	0.082	22.73	90.00	25.26%
31+40	3.00	4.00	44.00	2.11	0.082	18.53	90.00	20.59%
40+50	10.00	8.20	216.48	4.64	0.115	110.08	150.00	73.39%
49+00	14.00	6.90	191.82	4.28	0.085	125.00	297.00	42.09%
63+00	14.00	7.70	226.38	4.67	0.075	177.41	297.00	59.73%
76+00	15.00	5.30	135.68	3.51	0.120	54.86	327.00	16.78%

TABLE #4	
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SOUTH INTERCEPTOR DITCH HYDRAULIC PROPERTIES FROM FIELD SURVEILLANCE. WITH FREEBOARD

		FLOW			CALCULATED			
	CHANNEL	DEPTH		HYDRAULIC	MANNINGS	MAXIMUM	DESIGN	%OF
STATION	WIDTH (B)	W/FREEBD	AREA (SF)	RADIUS	N	FLOW (CFS)	FLOW (CFS)	DESIGN FLOW
3+25	5.00	6.40	113.92	3.39	0.060	90.05	36.00	250.13%
5+50	5.00	3.30	38.28	1.94	0.085	14.71	36.00	40.87%
14+00	5.50	5.20	82.68	2.88	0.045	78.10	36.00	216.95%
21+00	8.00	3.80	59.28	2.37	0.115	19.27	90.00	21.41%
29+00	6.00	1.90	18.62	1.28	0.082	5.64	90.00	6.27%
31+40	3.00	2.10	15.12	1.22	0.082	4.43	90.00	4.92%
40+50	10.00	6.00	132.00	3.58	0.115	56.51	150.00	37.68%
49+00	14.00	4.30	97.18	2.92	0.085	49.15	297.00	16.55%
63+00	14.00	5.10	123.42	3.35	0.075	77.50	297.00	26.10%
76+00	15.00	2.60	52.52	1.97	0.120	14.47	327.00	4.42%

NOTE: REQUIRED FREEBOARD RANGES FROM 1.5 FT TO 2.7 FT DEPENDING ON DESIGN FLOW

AS DETERMINED FROM FIG. 1-9 "DESIGN OF SMALL CANAL STRUCTURES"

36 CFS=1.5 FT FREEBOARD, 90 CFS=2.1 FT FREEBOARD, 150 CFS=2.2 FT FREEBOARD, 297 CFS=2.6 FT FREEBOARD, 327 CFS=2.7 FT FREEBOARD

MANNINGS NUMBER CALCULATED FROM: "BUREAU OF RECLAMATION DESIGN OF SMALL DAMS"

SOUTH INTERCEPTOR DITCH HYDRAULIC ANALYSIS

TABLE #5

SOUTH INTERCEPTOR DITCH HYDRAULIC PROPERTIES FROM FIELD SURVEILLANCE. 25 YR. 6 HR. EVENT

[illegible]

TABLE #6	
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SOUTH INTERCEPTOR DITCH HYDRAULIC PROPERTIES FROM FIELD SURVEILLANCE, 25 YR. 6 HR. EVENT

[illegible]

NOTE: REQUIRED FREEBOARD RANGES FROM 1.5 FT TO 2.7 FT DEPENDING ON DESIGN FLOW

AS DETERMINED FROM FIG. 1-9 "DESIGN OF SMALL CANAL STRUCTURES"

36 CFS=1.5 FT FREEBOARD, 90 CFS=2.1 FT FREEBOARD, 150 CFS=2.2 FT FREEBOARD, 297 CFS=2.6 FT FREEBOARD, 327 CFS=2.7 FT FREEBOARD

MANNINGS NUMBER CALCULATED FROM: "BUREAU OF RECLAMATION DESIGN OF SMALL DAMS"

ESTIMATED PEAK FLOW DERIVED FROM: "ASI STORM-RUNOFF QUANTITY FOR VARIOUS DESIGN EVENTS STUDY"

SOUTH INTERCEPTOR DITCH HYDRAULIC ANALYSIS

TABLE #7								
SOUTH INTERCEPTOR DITCH HYDRAULIC PROPERTIES FROM FIELD SURVEILLANCE. 25 YR. 3 DAY EVENT								
		MAX			CALCULATED		ESTIMATED	
	CHANNEL	DEPTH (D)		HYDRAULIC	MANNINGS	MAXIMUM	PEAK FLOW (CFS)	%OF
STATION	WIDTH (B)	W/O FREEBD	AREA (SF)	RADIUS	N	FLOW (CFS)	25 YR./6 HR.	25 YR. 3 DAY
3+25	5.00	7.90	164.32	4.07	0.060	146.89	20.00	734.43%
5+50	5.00	4.80	70.08	2.65	0.085	33.17	30.00	110.58%
14+00	5.50	6.70	126.63	3.57	0.045	138.21	45.00	307.14%
21+00	8.00	5.70	110.58	3.30	0.115	44.82	47.00	95.37%
29+00	6.00	3.80	51.68	2.25	0.082	22.73	63.00	36.08%
31+40	3.00	4.00	44.00	2.11	0.082	18.53	65.00	28.51%
40+50	10.00	8.20	216.48	4.64	0.115	110.08	79.00	139.34%
49+00	14.00	6.90	191.82	4.28	0.085	125.00	88.00	142.05%
63+00	14.00	7.70	226.38	4.67	0.075	177.41	98.00	181.03%
76+00	15.00	5.30	135.68	3.51	0.120	54.86	220.00	24.93%
TABLE #8								
SOUTH INTERCEPTOR DITCH HYDRAULIC PROPERTIES FROM FIELD SURVEILLANCE. 25 YR. 3 DAY EVENT								
		FLOW			CALCULATED		ESTIMATED	
	CHANNEL	DEPTH		HYDRAULIC	MANNINGS	MAXIMUM	PEAK FLOW (CFS)	%OF
STATION	WIDTH (B)	W/FREEBD	AREA (SF)	RADIUS	N	FLOW (CFS)	25 YR./6 HR.	25 YR. 3 DAY
3+25	5.00	6.40	113.92	3.39	0.060	90.05	20.00	450.24%
5+50	5.00	3.30	38.28	1.94	0.085	14.71	30.00	49.04%
14+00	5.50	5.20	82.68	2.88	0.045	78.10	45.00	173.56%
21+00	8.00	3.80	59.28	2.37	0.115	19.27	47.00	41.00%
29+00	6.00	1.90	18.62	1.28	0.082	5.64	63.00	8.95%
31+40	3.00	2.10	15.12	1.22	0.082	4.43	65.00	6.81%
40+50	10.00	6.00	132.00	3.58	0.115	56.51	79.00	71.54%
49+00	14.00	4.30	97.18	2.92	0.085	49.15	88.00	55.85%
63+00	14.00	5.10	123.42	3.35	0.075	77.50	98.00	79.09%
76+00	15.00	2.60	52.52	1.97	0.120	14.47	220.00	6.58%
NOTE: REQUIRED FREEBOARD RANGES FROM 1.5 FT TO 2.7 FT DEPENDING ON DESIGN FLOW								
AS DETERMINED FROM FIG. 1-9 "DESIGN OF SMALL CANAL STRUCTURES"								
36 CFS=1.5 FT FREEBOARD, 90 CFS=2.1 FT FREEBOARD, 150 CFS=2.2 FT FREEBOARD, 297 CFS=2.6 FT FREEBOARD, 327 CFS=2.7 FT FREEBOARD								
MANNINGS NUMBER CALCULATED FROM: "BUREAU OF RECLAMATION DESIGN OF SMALL DAMS"								
ESTIMATED PEAK FLOW DERIVED FROM: "ASI STORM-RUNOFF QUANTITY FOR VARIOUS DESIGN EVENTS STUDY"								

SOUTH INTERCEPTOR DITCH HYDRAULIC ANALYSIS

TABLE #9

SOUTH INTERCEPTOR DITCH HYDRAULIC PROPERTIES FROM FIELD SURVEILLANCE. 100 YR. 6 HR. EVENT

[illegible]

TABLE #10	
1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20
21	22
23	24
25	26
27	28
29	30
31	32
33	34
35	36
37	38
39	40
41	42
43	44
45	46
47	48
49	50
51	52
53	54
55	56
57	58
59	60
61	62
63	64
65	66
67	68
69	70
71	72
73	74
75	76
77	78
79	80
81	82
83	84
85	86
87	88
89	90
91	92
93	94
95	96
97	98
99	100

SOUTH INTERCEPTOR DITCH HYDRAULIC PROPERTIES FROM FIELD SURVEILLANCE. 100 YR. 6 HR. EVENT

[illegible]

NOTE: REQUIRED FREEBOARD RANGES FROM 1.5 FT TO 2.7 FT DEPENDING ON DESIGN FLOW

AS DETERMINED FROM FIG. 1-9 "DESIGN OF SMALL CANAL STRUCTURES"

36 CFS=1.5 FT FREEBOARD, 90 CFS=2.1 FT FREEBOARD, 150 CFS=2.2 FT FREEBOARD, 297 CFS=2.6 FT FREEBOARD, 327 CFS=2.7 FT FREEBOARD

MANNINGS NUMBER CALCULATED FROM: "BUREAU OF RECLAMATION DESIGN OF SMALL DAMS"

ESTIMATED PEAK FLOW DERIVED FROM: "ASI STORM-RUNOFF QUANTITY FOR VARIOUS DESIGN EVENTS STUDY"

SOUTH INTERCEPTOR DITCH HYDRAULIC ANALYSIS

TABLE #11

SOUTH INTERCEPTOR DITCH HYDRAULIC PROPERTIES FROM FIELD SURVEILLANCE. 100 YR. 3 DAY EVENT

[illegible]

TABLE #12	
1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20
21	22
23	24
25	26
27	28
29	30
31	32
33	34
35	36
37	38
39	40
41	42
43	44
45	46
47	48
49	50
51	52
53	54
55	56
57	58
59	60
61	62
63	64
65	66
67	68
69	70
71	72
73	74
75	76
77	78
79	80
81	82
83	84
85	86
87	88
89	90
91	92
93	94
95	96
97	98
99	100

SOUTH INTERCEPTOR DITCH HYDRAULIC PROPERTIES FROM FIELD SURVEILLANCE. 100 YR. 3 DAY EVENT

[illegible]

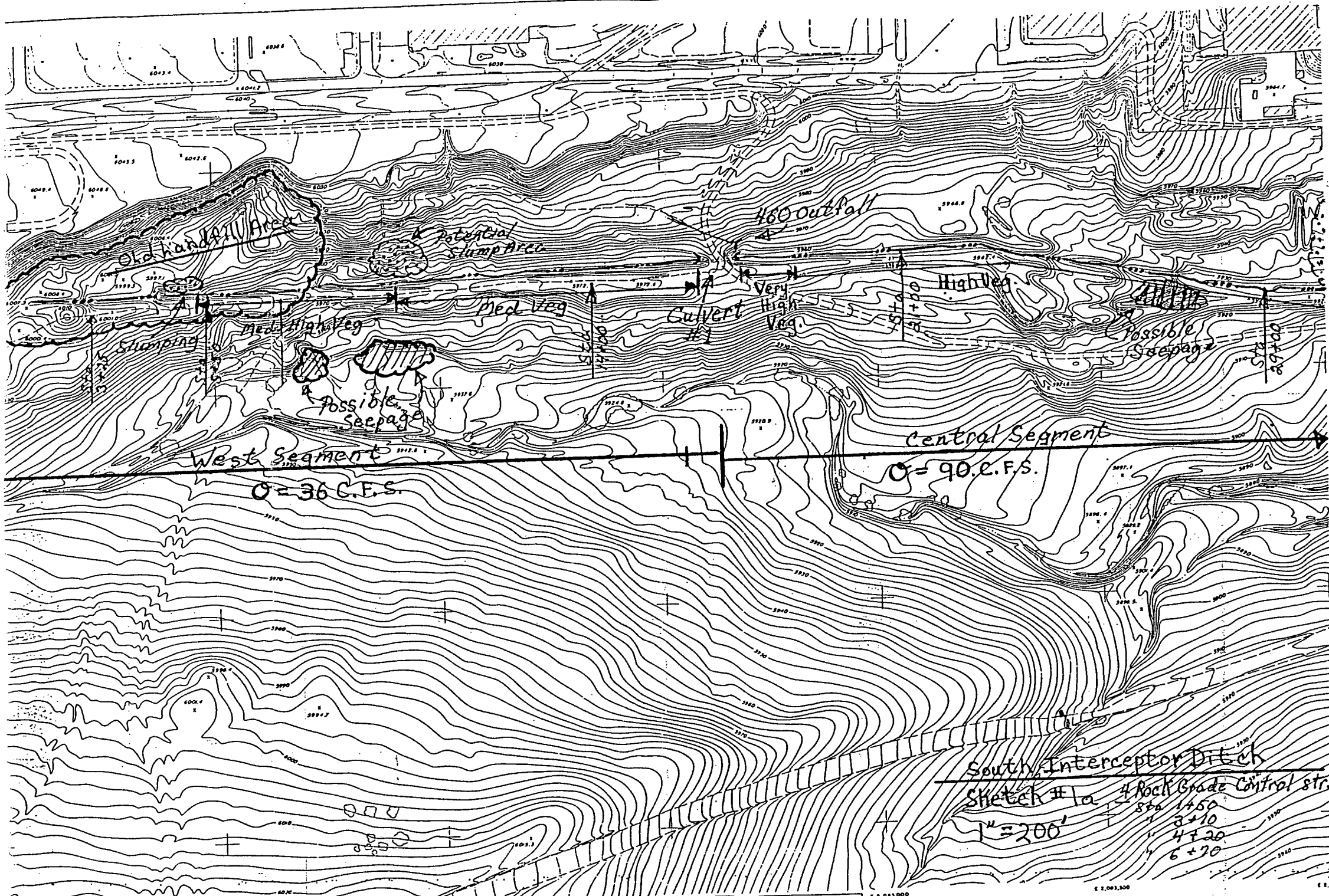
NOTE: REQUIRED FREEBOARD RANGES FROM 1.5 FT TO 2.7 FT DEPENDING ON DESIGN FLOW

AS DETERMINED FROM FIG. 1-9 "DESIGN OF SMALL CANAL STRUCTURES"

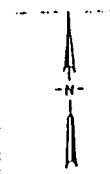
36 CFS=1.5 FT FREEBOARD, 90 CFS=2.1 FT FREEBOARD, 150 CFS=2.2 FT FREEBOARD, 297 CFS=2.6 FT FREEBOARD, 327 CFS=2.7 FT FREEBOARD

MANNINGS NUMBER CALCULATED FROM: "BUREAU OF RECLAMATION DESIGN OF SMALL DAMS"

ESTIMATED PEAK FLOW DERIVED FROM: "ASI STORM-RUNOFF QUANTITY FOR VARIOUS DESIGN EVENTS STUDY"



Rockwell
International
Rocky Flats Plant
Golden, Colorado



SCALE 1" = 100'
CONTOUR INTERVAL 2'

SHEET 32

South Interceptor Ditch
Sketch #1a 4 Rock Grade Control str.
Sta 1+50
3+10
4+20
6+20
1" = 200'

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